

T H E  
A R T  
O F  
Hatching and Bringing up  
DOMESTIC FOWLS,  
By means of ARTIFICIAL HEAT.

B E I N G

An Abstract of Monsieur *de Reaumur's* curious work  
upon that subject; communicated to the ROYAL  
SOCIETY, in January last.

By Mr. TREMBLEY, F.R.S.

*Translated from the French.*

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M DCC L.



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HATCHING and BRINGING up  
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By means of ARTIFICIAL Heat, &c.

THE very curious work of which I am here going to lay a short abstract before the Society, is entitled, *The Art of hatching and bringing up, in all seasons, domestic fowls of all sorts, by means of the heat of either dung or of ordinary fires*, printed at Paris in 1749, in two volumes in twelves: and the author of it, Monsieur de Reaumur of the Royal Academy of Sciences at Paris, Commander and Intendant of the Royal and Military Order of St. Louis, and Fellow of the Royal Society, has distributed it into two parts, into which indeed it naturally divides itself. The first of these contains the necessary instructions for the hatching of the eggs of domestic fowls, and even those of all other sorts of birds whatsoever; and

the other teaches how the young brood when hatched may be brought up, though entirely destitute of the assistance of any hens of their own species.

VOL. I. *Disc. I.*

The first volume consists of six discourses, which contain all that is necessary to explain the first part of the design. The second volume contains only four, whereof the two first give all the instructions requisite, for the raising and feeding the young birds, so that they may in no sort feel the want of their natural parents: the third shows the uses to which this new practice may be further extended; and the fourth sets before those, who shall have accustomed themselves to take pleasure in the raising of poultry, a sketch of the several amusements they may occasionally meet with in this practice, some of which are both useful and profitable, and the rest at least, very curious, instructive, and entertaining.

The manner in which eggs are hatched in *Egypt*, is well understood, only by the inhabitants of one single village, and those that live at a small distance from it, about twenty leagues from *Cairo* in the *Delta*, which village is called *Bermè*. The *Berméans* instruct their children in this art, and carefully conceal it from strangers; towards the beginning of autumn they scatter themselves all over the country, where each person among them is ready to undertake the management of an oven. Mr. *de Reaumur* gives an exact description of these ovens, which are of very different sizes, but in general capable of containing from forty to four-score thousand eggs. The number of these ovens is about three hundred and eighty-six, up and down



down the country, as is collected from the tax that every *Berméan* is obliged to pay to the *Aga* of the place, for leave to set up an oven: and they usually keep their ovens working for about six months. As therefore each brood takes up in an oven as under a hen, only one and twenty days, it will be easy in the six months to hatch in every oven eight different broods, and thus the three hundred and eighty-six ovens will give yearly, three thousand and eighty-eight broods of chickens. Every *Berméan* is only under the obligation of delivering to the person that shall have entrusted him with an oven, two thirds of so many chickens as there shall have been eggs put under his care, and he is supposed to be a gainer by his bargain, as there come ordinarily more than two thirds of the eggs to good. Mr. *de Reaumur*, to make a calculation of the number of chickens so hatched yearly in *Egypt*, supposes only that two thirds of the eggs are hatched, and that each brood is of no more than thirty thousand chickens: and thus it would appear that the ovens of *Egypt* give life yearly to at least fourscore and twelve millions six hundred and forty thousand of those animals.

A Great Duke of *Tuscany* formerly procured a *Berméan* to come over to *Florence*, where he hatched chickens in the same manner, and as well as in *Egypt*: and the late Duke of *Orleans*, some years since sent to the French Consul at *Cairo*, a set of queries drawn up by Mr. *de Reaumur*, concerning the manner of their hatching of eggs there without the assistance of hens, and those queries produced the memoir of *Father Sicard*, which contained very many curious and useful instructions.

The secret of the *Berméans* in *Egypt* cannot consist in the construction of their ovens, for these are public and exposed to the eyes of all the world:

the secret can only then consist, in the art of preserving the eggs in those ovens in a due degree of heat: and to get from them this secret of theirs, no more should be necessary, than only to be well assured, by observations, of the degree of heat which a hen gives to the eggs she sets upon. Mr. *de Reaumur* found many years since that the degree of heat necessary for this purpose, was the same nearly as that which is marked by the number 32 upon his *Thermometers*\*. This degree is nearly that of the skin of the hen, and what is remarkable of the skin of all other domestic fowls, and probably of all other kinds of birds. The degree of heat which brings about the developement of the Cygnet, the Gosling, and the Turkey-pout, is the same as that which fits for hatching the young *Canary* songster, and in all probability the smallest humming bird. The difference is only in the time during which this heat ought to be communicated to different birds. It will bring the *Canary* bird to perfection in eleven or twelve days, whilst the Turkey-pout will require twenty-seven or twenty-eight..

It is again to be remarked, that this same degree of heat is also nearly the heat of the skin of quadrupedes, and even of that of our own species. And therefore the Empress *Livia*, as *Pliny* relates, might truly hatch a chicken in her bosom, if she had

\* As the *Thermometers* made in *London* do not so commonly follow Mr. *de Reaumur's* Scale as that of *Fahrenheit*; it may be proper here to observe, that the degree of heat which Mr. *de Reaumur* expresses by the number 32, is the same which *Fahrenheit* expresses by about 96. But as the divisions are smaller in the *Thermometers* of this last than in those of the former, the several other degrees of heat which Mr. *de Reaumur* here expresses by the numbers 28, 34, 36, and 40, are the same that would have been respectively expressed by 92, 100, 104, and 110, very nearly upon *Fahrenheit's* instrument.

had but the patience to keep there an egg, for the same number of days as it ought to have continued under a hen. A lady that was known to Mr. *de Réaumur* in the same manner also, hatched in about ten days the eggs of a goldfinch.

It would not be easy to imitate actually in *France* or elsewhere, exactly what is practised in *Egypt*. In what villages should we meet with forty or fifty thousand eggs together, and those also not too long kept, as they do in the *Delta*? Hens are there become so very numerous, that according to *Father Sicard*, their eggs are not worth above two shillings or half a crown of our money the thousand. Nor could we ever attain to make hens and eggs as plentiful among us, as they are in *Egypt*, if we had no other ways of hatching our eggs but that of setting them under the hens. There are not more than the fourth, or the third part at the most of our hens, that are disposed to set every year: and those that are, are not for the most part so disposed at those seasons we would the most desire. We want therefore to help nature in this case, as we do in many others. We should be very ill provided with wines, with fruits, with herbs, and with roots, if we were only to content ourselves with such as are produced without art and cultivation. Eggs and domestic fowls make also a considerable part of the provision for our sustenance: and it therefore imports us to encrease the plenty of them as much as we are able.

The greater number of the hens which do set, would even then be laying eggs if they did not, and they are usually employed for near three months, in the setting and following of their chicks. It will not sure be too much to suppose, that in that time they might otherwise have laid about thirty eggs. And thus every hen that sets may be looked

ed upon, as costing thereby the price of thirty eggs, and she seldom in that time hatches more than fifteen. It therefore costs the value of a hundred thousand eggs, to set fifty thousand : that is to say a hundred pounds sterling, in those countries where eggs sell for three pence a dozen, and fifty pounds where they are sold for three half pence. Whilst it would be but a small part of that sum, that it would cost, if we could hatch the same number of eggs, in the same manner as the *Egyptians* do.

Mr. *de Reaumur* does not however promise himself, that he shall very soon see the *Egyptian* ovens brought into common use in *France*. The difficulty of gathering together a sufficient quantity of eggs sufficiently fresh and new laid, the prime cost of building the ovens, the want at first of persons capable of directing the management of them, and the trouble of forming others to the knowledge of it, are obstacles he says not easy to be removed ; without a far greater zeal than mankind commonly have, for the promoting with any trouble to themselves, what may be of use to the public. He has therefore sought for another analogous method of hatching chickens, either in great or in small numbers ; a method which should require no preliminary expence, which should be easy to be practised in the country, and by the most illiterate sort of people : but which might at the same time procure both agreeable and useful amusements, to persons of a higher rank, to such as should be capable of tasting the various entertainments which nature affords, in the rearing of young animals, and who would consequently be pleased with seeing their back yards stocked with variety of fowls and birds of several kinds : and who would not think that their time and care was in this way less well bestowed,

bestowed, than in the cultivation of the fruit trees, and greens, in their orchards and kitchen gardens, or of the flowers in their parterres. And sure, says he, such persons who shall have a genius capable of apprehending, that every occupation is ennobled by the use it may be of to society, will over and above be sensible that animated beings, such as birds of all sorts, cannot fail of presenting, yet more curious and satisfactory observations to a philosophical mind, than even those which are so plentifully afforded by the others, which in the scale of beings rise no higher than the vegetable world.

Mr. *de Reaumur* is indeed of opinion, that after some time, it would be possible to hatch as great a number of chickens in *France*, as they do in *Egypt*, and that, without the trouble of bringing over *Bermans*, without the expence of building ovens like theirs, and without any charge in combustible materials. He is persuaded that the heat upon other accounts to be given to their ovens, by the bakers and the pastry-cooks, to the furnaces of the glass houses, and those of the smelters of metals, might this way also be turned to profit. He has already made use himself of the ovens of three bakers for this purpose, and with good success. He gives us the description of the stoves which he has practised over those ovens: and they are exceedingly plain and simple. He made use of a chamber already subsisting over an oven, in the house of the *Community of the Infant Jesus* at *Paris*, and which he found sufficiently heated by that oven. This heat was indeed greater than was necessary to hatch chickens. There was therefore there nothing wanted, but to moderate that heat, and to keep it constantly pretty near to the degree required. Thermometers, placed in several parts of this room or stove,

stove, shewed the heat of the air in it; and when it wanted to be either encreased, or diminished, it was sufficient to encrease or to diminish the communication of this air with that abroad, by the opening or the shutting more or fewer of the passages or vents, that were made through the walls. The very first experiment that was made in this stove succeeded, and it was afterwards brought to a yet greater state of perfection. One may easily see, that the size and the form of those stoves, must change according to the situation of the oven and the size of the space above it. It will be enough here to take notice, that the heat of the ovens which are not heated every day, will yet, if well husbanded, be sufficient to answer the purpose: and that there has been no occasion at all, to add the least heat to those ovens, the days there was no bread baked in them.

From the very great number of ovens that might thus be employed, it is easy to see, that it would be practicable by their means to hatch an immense number of chickens: and it will be seen in the sequel, with what ease Mr. *de Reaumur* proposes also to rear those chickens. A baker's wife might with great conveniency, and with very little expence, in this manner bring up and feed a very great number of chickens, during the first weeks of their lives: whilst the country folks who should bring to market large chickens to sell, would surely be glad of the opportunities of buying up in the towns little ones, to carry back and to keep, till they should also become saleable at market in their turn. In country places where there is no oven, and where wood is cheap, a little room might be made use of, in the middle of which might be placed a small stove. Mr. *de Reaumur* gives the description of such a little room, and which

which he had also himself made use of, with good success for this purpose.

*Disc. II.*

Mr. *de Reaumur* had not yet thought of the use which might be made of bakers and other ovens, for the hatching of chickens, when he first attempted to perform the same by the heat of dung. He judges himself, that he should hardly have taken so much pains, as he has really taken, to overcome the great difficulties, which presented themselves in the course of this undertaking; if he had then known, that he could so easily have made use of the heat of common ovens. We should then have lost the very interesting and curious observations, which he made, whilst he was conquering of those difficulties. And this example, added to so many others, which the works of this excellent person afford us, cannot but give us the greatest satisfaction, to find that in all his attempts to advance and improve natural history and natural knowledge, he has at last got over difficulties, which at first appeared insurmountable, and many of which could hardly have been possibly removed, without such a degree of patience, and such a sagacity, as very few persons besides himself, have ever been endowed withal.

Several antient authors have related, that eggs might be hatched by the keeping them in dung, but none of those authors have told us that they had ever practised it themselves. Mr. *de Reaumur*'s observations prove to us beyond all doubt, that if they had attempted it, they would never have succeeded in it; if they had contented themselves simply with lodging of the eggs in dung, as they say that it was practised.

Dung

Dung is indeed capable of acquiring a much greater degree of heat, than that which is necessary for the hatching of Eggs: and Mr. *de Reaumur* has put eggs into an earthen pot, and lodged them in a layer of dung, where they have been almost stewed or parboiled. The first stoves with dung which he made use of, were somewhat of the form of the hot beds in our kitchen gardens: they were shallow, longer than broad, covered and sunk into the dung. Two of the first eggs that had been put into this sort of bed, shewed at the end of twenty-four hours, the beginning or the developement of a germ. This first appearance of success gave great hopes, and those hopes encreased during the following days; but after that an infected stench from several of the eggs gave notice that their germs had perished in them. These accidents were then almost continual, and Mr. *de Reaumur* had the displeasure to find, that every one of his chickens were lost before the day came on which they should have been hatched: and he had reason to be of opinion, that several of them had died by being exposed to too great a degree of heat. He applied himself therefore to regulate yet more and more the heat of his stoves, yet when he was thus well assured that this heat had constantly been kept at the degree requisite; he had again the dissatisfaction to find himself disappointed in his expectation of seeing his chickens hatch. At last after the loss of a very great number, he discovered that it was the vapour exhaling from the dung, that was the cause of their death. This vapour was very considerable, and easy to be perceived upon the side of the stove, and sometimes even upon the eggs themselves.

Mr. *de Reamur* then set himself to contrive matters, so that the eggs might be heated by the dung without

without being exposed to its vapour. He totally changed the figure of his stoves. He made use of a cask, which he partly sunk upright into a bed of dung, and the other end which was uppermost he opened for the setting into it baskets filled with eggs, but he could occasionally close it either more or less, as there was need to encrease or to diminish the heat of the air, within the body of the cask. The term now passed, before the expiration of which, Mr. *de Reaumur* had so often found his eggs to be all destroyed, and none of those that had been now placed in his new stove had as yet given the least token of corruption. On the 20th day, the little chicks began to peck their shells, and to make their voices heard ; and the next day several were compleatly hatched and came out. One will easily judge of the pleasure it gave him, to see at last the success of an experiment, he had so often repeated in vain, and that during the course almost of a whole twelvemonth, before he was fortunate enough to see one single egg hatched by the heat of the dung. He had now every day the fresh pleasure to see many chickens come forth, from the first batch of eggs he had placed in the cask. He was nevertheless still to be exposed to the displeasure of losing many broods, either totally or in part : of seeing the chickens of very many eggs die when they were almost come to the time they should naturally be expected to see the light. But these accidents so often reiterated, at length discovered to him, that even when there was not in the stove such a degree of moisture as to discover itself by sensible drops upon its sides, it might nevertheless be still filled with a vapour, that might sooner or later prove fatal to the young embryos. His following dissertations shew the means of removing the ill effects of this vapour, and all the other ob-  
stacles,

stacles, which had so long stopt him in the progress of his experiments. The whole at last comes to no more, than to a small number of very easy and very simple practices and cautions; and those such as require nothing, beyond the most ordinary talents and understandings of common country people. Upon which occasion Mr. *de Reaumur* takes notice, that he should have been ashamed himself to have made so many fruitless trials, before he could arrive at such easy and such obvious and commodious ways of succeeding: if the experiments of different sorts, to which he has now applied himself for so many years, had not abundantly taught him, that the slightest difficulties, even such as may seem at the first very easy to remove, have nevertheless often been capable of giving long delays to his enquiries: and that it is indeed very rare, that we are at the first enabled to consider objects, in that light, in which we ought really and truly to consider them.

*Disc. III.*

Monsieur *de Reaumur* had only given, in his second discourse, the general idea of his manner of hatching chickens, in stoves heated with layers of dung; but he gives in the three following, both the theory and the practice of this art, in a more circumstantial manner. It was not till after he had made a great variety of experiments, and those with very different success, that he became himself entirely master of it. The experiments that had succeeded the best, and those that had been the most unfortunate, had both been equally useful to him, and it was only by the comparison of those with each other, that he was perfectly enabled to know what was fit to be practised, and what was necessary

to be avoided. The first part of this practice requires the knowledge how to make and to dispose the ovens or stoves, in which the eggs are to be placed: but this is not what is the most difficult, the care which these stoves require in their management, and the precautions that are to be taken about them, to make the main operation succeed, is what is the hardest and what requires the greatest delicacy. Yet is all that to be got over, by the means of a very few, and those very easy precepts; and the several facts upon which the natural and physical observations are founded, which naturally lead to those precepts, are distinctly delivered in the third and fourth dissertations.

It is proper to have, at the same time, two stoves at the least to relieve each other: that if at any time the air in one of them is too much cooled, or that any other accident has happened to it, the eggs may be immediately removed into the other. These stoves are to be placed where they are covered from the rain, but where the air may have a free and continual circulation, that the vapours which exhale from the dung may be regularly and constantly carried off: care is however to be taken, that through too much attention to the changing of the air, it may not by that means be suffered to become too cold.

It is proper to coat the inside of the casks with plaster, that the vapours of the dung in which they are to be set, may not penetrate through their joints: or one may instead of plaster, line the insides of the casks with thick pasted paper, or with plates of tin, or indeed one may even make the whole stoves of such plates, in which last case they would also be the easier to heat, and to preserve in a proper temper.

Nevertheless

Nevertheless Mr. *de Reaumur* has had chickens hatched in casks absolutely unlined, and it is therefore only for greater security that he advises these precautions to be made use of. The lower ends of the casks are to rest upon a bed of hot dung, of the thickness of a foot and a half, or of two feet, and the outer superficies are to be surrounded with another like bed, at the distance of about two feet from their circumference. The ovens or stoves thus formed, are to be considered as ovens whose mouths look upwards; and the covers which serve to close these mouths, are to be made of several pieces, by means whereof they may be more or less shut up, as the regulation of the heat may happen to require.

Mr. *de Reaumur* made use of casks of about half a hogshead, or a hogshead in content. New dung in which the straw is mixed with the soil is the best for the heating of the stoves: And one should always be provided with a heap of such dung, to give them fresh heat, whenever they appear to have a disposition to cool. One may either use the dung of horses, or that of cows or of sheep. They frequently make in the country dunghills by art, composed of weeds or other useless greens, mixed up with a little true dung: and Mr. *de Reaumur* has observed that these dunghills also, have preserved for several months together, a degree of heat more than sufficient to hatch eggs. One may therefore upon occasion make use of this sort of dung as well as of any other, or even of tanners bark.

*Disc. IV.*

It is from the Thermometer that the heat of the stoves is to be learned, and it is easy to instruct the most

most ignorant in the uses of this instrument. It will be sufficient in the Thermometers which are to be put into the hands of country people, that those terms only be noted, which they are to be made acquainted with. It will be proper to try a thermometer before it is used; and that either by comparing it with another of known goodness, or by keeping its ball for about a quarter of an hour under one's arm: and by this means one may even change one of the worst thermometers into such a one as may safely be confided in. Since it will only be necessary to note the place where the fluid within it stands, at the moment when it is taken from the bosom.

Monsieur *de Reaumur* has also contrived a sort of thermometer, which any one may himself easily make or provide: take only a lump of butter of the size of a walnut, melted with half as much tallow, and put them together in a small transparent vial. The heat of the stove will render the mixture in the bottle as liquid as oil if it is too great, or the lump will remain fixed in one place if it is too small, but it will flow like thick syrup upon inclining of the bottle, if the stove is of a right temper: all which one may further be assured of, by trying the heat of the bottle in one's bosom, as was before observed.

It will take two or three days to give to a new stove the proper degree of heat: and it is not till after one has assured one's self of that degree, and that the inside of the cask is sufficiently dry, that one should venture to place the eggs in it: and these eggs should not besides have been kept too long, though they may be kept somewhat longer in the winter than in the summer season. They may be put into shallow baskets, whose diameters

are proportioned to the width of the casks they are to be placed in ; and one may safely lay two tires of eggs upon one another : but that which is to pass when the eggs come to hatch, requires that the eggs in the upper layer, should not lie so close to each other as those in the lower.

It will not be necessary at the first to fill the basket with eggs ; fresh ones may be put in daily, as the hens happen to lay them : and then it may be of use, to write near the small end of each egg the date of the day when it was first placed in the stove.

The natural position is for the eggs to lie along, they will hatch nevertheless in whatever posture they shall have been placed.

One basket of the size to go easily into a cask of a hogshead, will conveniently hold about a hundred and fifty eggs ; and when one is but beginning to make experiments, it may be proper not to put more than one basket into a stove at the same time.

It will sometimes happen, that the heat shall be equal from the bottom of the stove, to within three or four inches of its top ; but at other times it will be found different at different heights. The best place is commonly a few inches higher than the middle of the cask ; and that is where the basket, when there is but one, should be placed : when two or three baskets are to be put in at a time, a little more care must be taken to regulate the heat, and a little distance should be left between each basket.

The heat is always very nearly the same through the whole extent of a basket ; when there is any difference, it is the middle of the basket that is the hottest.

The heat of the air in a stove is always diminished, when a new basket is placed in it, for the eggs which it contains are colder than the air ; therefore

fore to warm the stove again, a great part of its opening is to be closed, but it must not be quite shut up, because that the circulation of the air is never to be entirely intercepted. It should not then be left above an hour without examining its heat by the thermometer, to know whether its mouth is to be continued equally closed ; and it will be proper to repeat that examination every hour, for five or six hours successively.

It will not after that be necessary to make such frequent visits to the stove, when the heat shall have been once brought to its proper degree and fixed at it. It will then be enough to see five or six times in a day in what condition it is, at night as late as may be convenient, and as early in the morning. Yet there may be circumstances when it may want to be visited even in the night.

Sudden changes from cold to heat, and from heat to cold, in the air we breathe, must also produce like changes in that contained in the stoves. They will therefore in such circumstances require a double attention ; and the same will also be necessary in very moist weather : for such weather sometimes causes a fermentation in the dung, which occasions it to heat, more than one would readily have expected.

Some days after the eggs shall have been placed in the stove, it will probably be observed that the liquor in the thermometer will not be kept at its due height, without keeping the mouths of the casks more closed than during the preceding days : and this decrease of the heat within the stoves, will be an indication that the bed of dung upon which they stand has also cooled, and that its heat wants to be renewed. But this operation is no ways difficult to perform, it will only require that a thin bed of very warm fresh dung should be spread all

round about the casks. During the hot and even the temperate months of the year, it will be sufficient thus to renew the heat once a week, in the cold months it will not be too much, to do it every three or four days.

Great attention should be given to the stoves for some hours, after fresh dung shall have been thus applied, for the heat may sometimes happen to encrease to a very considerable degree.

One may also heat the dung already used, by the moistening of it, for the fermentation will thus be renewed, that was before extinguished, and that will be quickened that was only become too weak.

When the heat of a stove shall be considerably diminished, and it might be dangerous to wait for the effect of the fresh dung, one may put into the stove itself a pan of warm ashes with a few lighted embers.

That the eggs may equally share the irregularities there may be of the heat, in a stove wherein there are several baskets together, those baskets may be made every day to change their places: one may also turn every basket a quarter or half round about, that so every portion of its circumference may as much as may be change its place, with regard to the sides of the stove.

By making the eggs thus to change their situation, one will but imitate what the hens themselves do by those upon which they set, and their natural actions are surely to be attended to, as the most proper to instruct us upon this subject. Hens are frequently seen to make use of their bills, to push to the outer part those eggs that were nearest to the middle part of their nests, and to bring into that middle part, such as before lay nearest to the outside of the same.

Here

Here follows one of the experiments which Mr. *de Reaumur* made, to assure himself of this process in a hen; he set under one twenty-two eggs, which were disposed upon one another in three tires. They were all well set upon, for from the twenty-two eggs he had nineteen chickens. He had numbered them all, and had placed the first numbers 1, 2, 3, 4. in the bottom of the nest; and the eggs marked with the following figures were placed upon them: but at the end of two days, there remained no signs of the order in which he had placed them, the lowest numbers were uppermost in the nest, and the highest numbers were now the lowest. This labour was considerable for the hen, she was as it were to draw eggs out of a hole to remove them to the top of her heap; and she must therefore have been prompted to take this trouble by the necessity of it to her main end: but when the hens themselves first dispose their eggs to be set upon, they are placed all in one and the same tire, and consequently are then much more easily removed.

If hens went often off from their eggs, or that they left them for any considerable time together, they would be much more cooled, than what they can bear without danger. They must nevertheless leave their eggs to feed, but they generally content themselves with only one meal a day, and in that meal they seldom employ more than ten minutes or at most a quarter of an hour.

The reflections to be made upon the degree of cooling, to which eggs are exposed in the ordinary course of nature, give us reason not to be too solicitous about the apprehensions we might otherwise have, from the small variations that are inevitable in the heat of our stoves. Nature has happily not required the greatest precision, in the means she makes use of for the bringing about her operations.

It is with degrees of heat, very unequally distributed, through different years, that she causes plants to vegetate, and that she furnishes us with fruits, and the several sorts of grain. And thus there is a latitude also in the degrees of heat, both above and below that marked with the number 32 upon the thermometer, that is no way destructive to the chickens in the eggs. It appears by Mr. *de Reaumur's* experiments, that the fluid may fall to thirty, or rise to thirty-four, without being detrimental, nay he had some eggs hatched, that had been exposed at times to a heat of only twenty eight degrees, and others to that of forty.

Yet must one not be ignorant, that chickens have often been killed by too great a degree of heat of some continuance, whilst others that have been equally exposed to the same have held out against it. The excess of heat is more to be apprehended for chickens that are near to the time of their hatching than it is for others. When the heat that has been continual in the stoves, without rising much higher, has been kept at thirty three or thirty three degrees and a half, the chickens, far from suffering by it, have on the contrary been hatched a day or two sooner than was expected. And again, when the heat has been only suffered to rise to about thirty one degrees or a little less, the chickens have been hatched about a day or two later, than they would have been hatched by a hen.

There is made a considerable evaporation from the interior parts of an egg whilst it is set upon, or whilst it continues in the stove: and it generally has suffered the loss of about one fifth part of its first weight, by such time as the chicken has been ready to hatch.

No developement of the embryo will be made in an egg from which nothing can perspire, nor  
will

will there be any alteration made in it, as appears by the following experiment. When the shell of an egg is covered with a varnish that choaks up its pores, it may be kept under a hen more than thirty or forty days, without being at all corrupted, or having the young embryo in the least advanced.

Among the chickens of the same brood, either hatched in a stove or under a hen, there are some that will come forth about a day later than the usual term ; and this probably happens from the shells not being always equally hard, whereby the requisite transpiration, is in some performed a little sooner, and in others a little later than ordinary.

One must be but little acquainted with the several uses of the shells of eggs, if one barely looks upon those shells, as cases to contain the eggs, and to keep them from being bruised under the hen. They serve besides to prevent too quick and too abundant a perspiration of the within contained fluids : and an egg without a shell, can neither be preserved nor hatched, but will be dried up in a very small time,

*Disc. V.*

It has already been remarked, that the varnish with which eggs may be coated, occasions their germs never to unfold, because their perspiration is in that manner prevented ; and this may serve to give us some idea how it comes about, that moisture is so pernicious to the little chicks that are still in their eggs ; for this moisture in some degree hinders the perspiration of those eggs.

Mr. *de Reaumur* assured himself by an experiment, that was alone capable of preventing eggs from being hatched with any success. He placed eggs in a pan filled with water, the pan was set

in a stove, and the water was constantly kept to its due degree of heat, but the germs in the eggs were never at all unfolded.

When the moisture in the stoves has been considerable, the chickens have constantly perished very early, when that moisture was small they did not perish till later, and sometimes not till they were just ready to hatch. The chicken in this last case takes its encrease, but without that vigour and strength which should enable it to pierce the walls of its first dwelling and to come forth: so that it has constantly perished before it came to see the light.

The egg which is hatching does not only transpire, but it inspires also. We know the measure of the quantity of the matter, that has transpired from the different substances of the egg, by the void that is found at its larger end, and which visibly encreases every day: and this void is filled again by the air which the shell gives an admittance to from without. Yet is it not the air only that penetrates through the pores of the shell, those pores will also let in the infected vapours that are capable of destroying the chickens in their shells, and of making them rot. One rotten egg left under a hen for four and twenty hours, is sufficient to occasion the destruction of a whole brood: and one of the constant occupations of the *Berméans* in *Egypt*, is to remove upon that account from time to time the eggs that become rotten out of their stoves.

A moisture that is barely of a watry nature, does not cause the substances of the eggs to corrupt, unless it is very excessive: but a much less degree of moisture, when it is charged with those particles of the dung that are capable of offending our smell, never fails to produce in the eggs such a corruption,

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as destroys and dissolves the young embryos. Yet has Mr. *de Reaumur* assured himself by experiments, that even the smell itself of the dung, is only injurious to the chickens when the air that carries it is also loaded with a certain quantity of moisture.

The time probably in which a free perspiration is most necessary to the chickens, is that when it will very soon become necessary for them to breathe: for it is just then that above three fourths of those perish, which have been exposed to damp, and which are thereby destroyed in their eggs. The voice and the cry of the chickens which are heard, before one can perceive even the least opening or crack in their shells, is a proof that they begin to breathe before their shell is opened.

It seems to be chiefly the long continuation of the action of the air charged with vapours, that is noxious to the eggs. What that vapour shall not have been able to do in eight or ten days, it will be able to accomplish in twenty. Mr. *de Reaumur* has taken eggs that had been already ten, twelve, or fifteen days set under a hen, and he has then put them into a stove, which enclosed some of these noxious vapours: yet have the chickens been hatched from these eggs, as if they had continued under the hen; whilst those which should have come forth at the same time, from the eggs that had continued all along in the stove, were all found dead in their shells, though otherwise as large and fair to appearance, as they should naturally have been.

Mr. *de Reaumur* has saved the lives of several chickens, by making a small opening in the shell at the larger end, about the seventeenth or the eighteenth day. He by this means introduced into the egg the air necessary to the chicken, and which the vapours that clogged up the pores had intercepted:

cepted: but this operation is hurtful, if it is performed upon eggs that have been set less than fifteen days.

The true way to preserve the lives of the chickens in the eggs, is to prevent the air which fills the cavity of the stoves from being too much charged with vapours; and these vapours, as has been observed, are sometimes imperceptible and yet pernicious. It would therefore be necessary to have a *hygrometer*, by means of which one might know when there is moisture in the stove. Mr. *de Reaumur* has found one of a very simple and easy kind: he only lays into the stove a cold egg, and a quarter of an hour after, he examines whether its shell is become moist. If it has remained dry, it will be a proof, that there is not in the stove any damp to be apprehended. But if on the contrary the shell is become wet, and that it continues so for several hours, it will be hazardous to set any eggs in that stove.

Mr. *de Reaumur* then teaches several ways of dissipating the vapours in the stoves.

The matter which transpires continually from the eggs, is itself capable of forming a vapour that may become noxious to these same eggs, when the air in the stove is too much charged with it: and that circulation which ought constantly to be preserved in the stove, is the most effectual way to remove this inconvenience. It is even apparent that the necessity which a hen is under every day to leave her eggs for some time, to take her nourishment, is of considerable service to those same eggs; for the air which stagnated under the hen, and which was loaded with the vapours transpired from the eggs and from her own body, will thus be again refreshed and exchanged for other

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air, that will be of a more pure and wholesom nature.

Almost all the eggs of several consecutive broods, have been spoiled under a Turkey hen, that continued to set for three whole months together; she was sometimes several whole days without ever leaving her eggs, or getting off of them, and she had her meat and her water given her in her nest.

All the various accidents we have been speaking of, will perhaps make some people look upon the undertaking of the hatching of chickens by the heat of dung, as somewhat too difficult to be attempted with any prospect of success. But if a like enumeration had been made of all the several accidents, that might possibly prevent a crop of corn from being successful, it is very probable that some persons also might have been inclined never to take the trouble of plowing up the ground, or of sowing in it at a considerable expence, large quantities of grain; were they not on the other side encouraged to hope for better success by daily experiments. Mr. *de Reaumur* will thus also encourage us to persevere in our attempts in the present case, by the success of those trials of his own and other people, that have succeeded to his wish, and given him as many chickens as he could possibly have expected. In matters where the operations of nature are concerned, what has once succeeded will always succeed, provided that the same circumstances shall again come together: and if those necessary circumstances are but once well known, it will be no hard task to secure their concurrence.

*Disc.*

*Disc. VI.*

Mr. *de Reaumur*, to prevent the vapours of the dung from getting into his stoves, again invented another sort quite different from those he had made in casks. These consisted of long chests open only at one end, and well closed every where else, the open ends of these chests were placed in a room separated by a wall from that where the remaining parts of the chests were lodged ; and thus the air in the stoves was renewed, without having any communication with the air of the room that contained the dung. This idea, says he, which one would think should have first presented itself, came however but late into his mind ; and this has indeed fully answered all his expectations. He has already made both with fire, and with the heat of dung, a sufficiently great number of experiments, to be able to assure his readers, that they may not only in these ways hatch eggs at abundantly less expence than they can have them hatched by hens, but that they may also thus, in proportion, have a much greater number of chickens from the same number of eggs, than they could have obtained by setting them in the common way. Mr. *de Reaumur* has himself frequently, from small batches, had as many chickens as he had set eggs, though in the larger it is always to be expected that some must be lost. Yet the sister *Mary of the Community of the Infant Jesus*, who had applied herself with great diligence and exactness to the care of her stoves, had once from three hundred eggs, two hundred and ninety six chickens, so that she only lost four, and even those not till the time when they were actually pecking of their shells.

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The truly interesting moment is that when the chickens hatch, and this moment, the success of which is to reward those who take the charge of these stoves, for all their care and trouble, will yet require some further attention. Some chickens which would otherwise lose their lives, may be still saved by helping them to get out of their shells, and that is a piece of assistance they could not receive from a hen.

The chicken is almost a round ball as it lies in its shell, the neck is bent and disposed along the belly, and the bill is turned under the wing as we often see in birds asleep. The chicken however in this situation is to break its shell; and this it performs by strokes of its bill: the first effect of these strokes is a small crack, for the most part between the middle of the egg and its bigger end: the fore part of the chicken points towards that end, and the hind part towards the lesser. The chicken then, by striking the shell with its bill, insensibly turns itself about from the left to the right, and it is accordingly always from the left to the right, that it prolongs the crack first made in the shell, till it extends almost quite round the circumference of the circle the bill has described: and it is commonly the work of near half a day, for a chicken to get out of its shell. To get out, it pushes its body forward with its feet, and thus it forces the anterior part of the shell to rise up, and so compleats the breaking away the shivers that still connect that half shell with the inferior one. When it is thus got almost quite out, it draws its head from under the wing, where it had till then remained: it next extends its neck, but is still frequently several minutes attempting, before it has the strength to raise itself; by little and little

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it then seems to grow stronger, and when it has for a little while dragged its legs after it, it at last becomes able to stand upon them, and to stretch out and erect its neck, and to carry its head upright.

### VOL. II. DISC. I.

It would at the last be but a useless undertaking, to hatch chickens, and those in as great a number as should be desired, if we could not afterwards promise ourselves to preserve them, and to be able to bring them up. What could be done with so vast a stock of chickens, all as it were brought forth at the same time, and all unprovided of those natural parents, which might seem so necessary to them, to keep them warm, and to defend them from the injuries of the weather? This difficulty is not however unsurmountable: for capons have by art been taught to lead about, to watch over, and to cherish and keep warm, the chickens that have been entrusted to their care; and that even as well as the hens could have done, under which they might have been hatched. *Gesner, Willughby, and divers other authors who have wrote concerning the œconomy of the country, have related this fact: and Mr. de Reaumur describes the manner of forming capons to perform this service. He has himself seen above two hundred chickens at once, all led about and defended by only three or four such capons: those capons clucked like the hens, to call in the chickens that had strayed too far off; and they again redoubled their call, when they found any nice bits, to invite the young brood to come and pick them up and eat them. Nay Mr. de Reaumur has even had a cock among his*

his poultry, which had been formed in the same manner as the capons just mentioned: and this cock no less carefully led about the young chickens he was entrusted with, never neglecting nor leaving them, but when he saw a hen disposed to receive his addresses; he then indeed ran eagerly to her, but immediately after returned quietly to his chickens again.

The capons and the cocks once so taught to tend chickens, will constantly after, do it all their lives.

But Mr. *de Reaumur* has not barely been satisfied with the assistance he could thus procure from cocks and capons, in the bringing up of his chickens. He has also found the means to raise them both by the warmth of the dung, and by that of an ordinary fire: he has even shewed the advantages which have resulted from this last expedient; and which are such, that he even thinks there might be a gain, in the taking away from the hens the chickens they should have hatched themselves, in order to bring them up, in the new manner which he has discovered. He has reared chickens with great success in his stoves heated with dung; wherein they were fully sheltered both from the cold, and from all other dangers: and he has also brought up others, in much larger rooms, heated either with dung, or with ordinary fires. The heat indeed of these last rooms, cannot be every where so equal as that in a stove. It was therefore necessary that there should be in each of them some particular places warmer than the rest, into which the young chickens might occasionally retire as they would under the wings of a hen; and these last places were a sort of boxes without bottoms, lined within with furs. He now indeed found, that no natural parent could be of

so general a use to the young chickens, as these artificial parents were, for such he chose to call them. The chickens would immediately find the benefit of them, they presently grew fond of them, and took refuge under their shelter, with the same readiness as they would have done under the wings of real hens.

One cannot give to these artificial parents, all the several forms one would chuse, and which might at first appear equally proper: and it was not till after Mr. *de Reaumur* had lost a considerable number of chickens, that he became perfectly acquainted with the manner in which they ought really to be made, so as to prevent the chickens from running the risque, of being bruised to death, or of being sometimes smothered under them.

It will be necessary to regulate the heat of the places in which chickens are to be brought up: for too great a degree of heat will as certainly kill the chickens after, as before they are hatched. Mr. *de Reaumur* has had some destroyed, by being exposed for some time to the heat of thirty eight degrees: and those same vapours which, as has been seen above, have proved destructive to chickens yet inclosed in their eggs, are also capable of destroying such as are already come forth. Smoak is also very pernicious to them. In the coldest weather chickens may easily be brought up, in these rooms so heated by art, of which we have just been speaking: but in fine summer days, and principally when the chickens shall have already got over a few weeks, they may safely be exposed to the open air of the court yard. They should then indeed, at the first, be put into a large cage, resting upon the green fwerd, and exposed to the sun: in which likewise it would be proper to place one of our artificial parents, to shelter them

hem as there should be occasion; though they should also have liberty to go out from the cage, and to run about, both to seek and to pick up insects. One might indeed be afraid, that being without a leader, they might disperse too far, whereas the clucking of a hen or of a capon, when they are with such, calls back to the flock those that have straggled too far from it. But in truth they love to keep together, and when any one gets at too great a distance from its company, it will soon discover by its cry, that it is in some distress: it will then stand still and listen till it hears the voices of its fellows, which will soon bring it back to them again.

Something should now be said of the different sorts of food that may with convenience be given to young chickens. A considerable part of the yolk of the egg will have been left unconsumed by the little chick in the shell, and that part does not enter into the body of the chick, till a very little time before it is ready to break forth; that yolk is there to be digested by the young bird, which will consequently for some time be nourished by it: and it is for that reason, that chickens are generally more than a day without taking any food after they are hatched. The first nourishment afterwards that Mr. *de Reaumur* has generally given, has been a few crumbs of bread, and at the end of a few days he has mixed with those crumbs some seeds of millet, after which it will not be long before they begin to pick up grass and insects their selves. One may easily also gather together worms, or insects to give them; and the heat of the stoves and the other places in which poultry are kept, draw thither besides great numbers of small flies, which they readily catch and eat very greedily.

A chicken just hatched has a craw, which may be filled with a quantity of food equal in size only to a pea; at the end of some weeks that craw will be capable of containing the bulk of a common cherry: and from hence it may be observed, that what it will cost daily at that age either in bread or in millet, can come to very little. But as the chickens grow, the capacities of their crows must increase also considerably, and it will then be worth while to consider, how to provide them with food, at a small expence. The sorts of grain with which poultry may best be fed, are oats, buck-wheat, barley, *Turkish* corn, rye, and wheat.

Mr. *de Reaumur* has successively fed several hens, with all these different kinds of grain, to inform himself if they eat equal quantities of the several sorts: and here follows what several repeated experiments have taught him upon that subject.

A common hen that has all the day long grain at her will, eats in a day  $\frac{8}{32}$  of a measure of barley, buck-wheat, or oats, but she will not eat more than  $\frac{5}{32}$  of a measure of wheat,  $\frac{5}{32}$  of a measure of *Turkish* corn, and only  $\frac{3}{32}$  of a measure of rye: by a measure is here meant the quantity of about one 48th part of a *Winchester* bushel, or the 12th part of a peck \*.

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\* The translator of this abstract, being of opinion, that a just idea of the author's meaning could not in several places be conveyed to an *English* reader, unacquainted with the affairs of *France*; unless certain values in *French* money, and measures of capacity, by him mentioned, were reduced to such others thereunto equivalent, as are here in common use. He has therefore, throughout the abstract, taken the liberty to translate the prices of grain, &c. as therein expressed in *French* money, into *English* money nearly of the same intrinsic value; upon the supposition that the *French Livre* is at this time equal to ten *English* pennies, and consequently the *French Sol* equal only to an *English* half-penny: which is exact enough to answer

One might imagine that those sorts of grain, of which a hen consumes the least, should be the most heavy, and to try if it was really so, Mr. *de Reaumur* weighed all these different sorts, and it appears by the table he has made, that buck-weat weighs more than either barley or oats, and yet a hen to feed her requires as much buck-wheat in a day, as she does either barley or oats, and she will eat more wheat than oats, though wheat is a yet heavier sort of grain.

Is it the taste and the liking of the hens, that determines them to eat more of one sort of grain than of others? To make a judgment of this, Mr. *de Reaumur* gave the several hens several sorts of grain at the same time, sometimes mixed together, and sometimes separate: and his experiments have taught him that it is not so easy as one would think, to determine which are the sorts of grain

swer any common purpose. He has also in reducing the measures supposed, that the *French Boisseau* is equal to one third only of our *Winchester* bushel, and consequently the *Sextier*, which contains twelve *Boisseaux*, only to our comb or measure of four bushels. This supposition is not indeed exact, but sufficiently near to truth to answer the present occasion: for the *French Boisseau*, which they divide into sixteen *Litrons*, is said to contain five hundred and seventy six cubic inches of *Paris*, which will be found equal nearly to six hundred and ninety nine cubic inches of *England*, the *Paris* inch being very nearly to the *English*, as sixteen to fifteen; but the *Winchester* bushel contains better than two thousand one hundred and fifty like cubic inches, which last number divided by six hundred and ninety nine, gives for its quotient a very little more than three. Again in the former part of this paper, he has translated the word *Muid*, the name of a cask, by that of *hogshead*, which is also near enough to the truth for the design it is here used: though to speak more exactly, the *Muid* is said to contain two hundred and eighty eight *French Pintes*, according to which, the *French Pinte* being generally accounted equal to the *English* quart, the *Muid* will really contain nine gallons more than the *English* hogshead, supposed to measure sixty three gallons, or two hundred and fifty two quarts.

grain that the hens like the best. It appeared to him that some eat more willingly that sort of grain they had been already accustomed to, than the other sorts that were also set before them. Again it appeared to him that the appetites of some others were encreased by a new kind of food. One meets with, says he, among them, examples of the same humoursome taste, which we see so common in our own *species*. It however appeared to him in general, that among the several sorts of grain above specified, rye was that, of which the hens were the least fond.

It has been observed, that the quantity or the bulk of grain that is boiled, is thereby encreased. Mr. *de Reaumur* gives a table of this encrease of quantity, by which it appears, that it is greater in certain sorts, than it is in others.

Many repeated experiments have also informed him, that considerably the greatest number of the hens, preferred the boiled grain, to that which was raw, and he even found that there was thus a sensible saving in the feeding them with grain which was boiled, rather than with that which was not. The greatest advantage upon this account was in the barley; and there was a saving of  $\frac{2}{3}$  of the quantity, in the giving it to them boiled.

By Mr. *de Reaumur's* experiments, a hen that is fed all the year at discretion with dry barley, a quantity of which equal nearly to a comb, or four *Winchester* bushels, costs six shillings and three pence, according to its mean price last year at *Paris*, will stand her owner in about three shillings: but if she is fed with boiled barley instead of raw, she will not cost him in the year more than two and twenty pence halfpenny: if she is at liberty to go about and pick up among the dung and in the

he yard, worms and insects, she will hardly then cost him so much as a shilling, and if lastly besides that, she is at liberty to eat as much grass as she is naturally inclined to do; she will not in the whole year put him to the expence of above six pence in corn.

Mr. *de Reaumur* to make out otherwise, that this valuation of what the feed of a hen may cost in a year, is tolerably near the truth, gives another example more in the great, of what his own back yards have lately stood him in. His hens are at full liberty to stray about those yards, in which they find both grass and insects. He there keeps a very great number, and he finds that by judging of what they can eat in a whole twelvemonth, by what they actually did eat, during the months of *November* and *December* preceding, a hen does not consume more than about the third part of a bushel of raw barley in a whole year, and which costs upon the supposition above laid down, but very little more than six pennies.

Again, barley is cheaper in the ~~country~~<sup>Provinces</sup> than it is at *Paris*: and that is not besides the only reason, why a hen should yet be less expensive to keep in the country, than she is in a great city. When they have very large places to stray over, the dunghills and the green swerds, furnish them abundantly with food of various sorts. It would also be easy to carry into the fields whole troops of chickens, and those to choose which had been hatched and raised in stoves; and which have never been accustomed to follow a hen: since, as much greater numbers of these have been hitherto brought up together, they will naturally be more inclined still to keep together; and they are besides a great deal more familiar.

But without turning the poultry out of the yards, one may even feed them there, with the same provisions that they would find in the fields. One might easily get together herbs and insects of diverse sorts, and especially earth worms, which they are much fonder of, than of any other nourishment.

The labour required for the looking after the stoves, in which chickens are hatched, and for the bringing up those chickens afterwards, cannot come to any thing very considerable; since one single person would be able to look after several stoves, and to raise an immense number of chickens.

Those persons in the country, who have about them conveniences for the raising of poultry, would hardly perhaps be solicitous about the having of stoves to hatch their chickens in: wherefore it might possibly be more desirable, that some persons only in villages should employ themselves this way, who would make it their chief business to keep stoves, to take in for a proper consideration, eggs from their neighbours, and to bring up the chickens hatched from them, till they should be able to shift for themselves.

It is about great towns, and principally in the neighbourhood of the capital city, that it would be of the greatest importance, to promote the establishment of this sort of stoves. And those would mistake, who should imagine that the more distant provinces are the properest places, to encrease the poultry in, because it may there be brought up at the least expence. For it is not to be expected, that poultry can, like oxen be brought to town, from the distance of three or four hundred miles; the charge of driving an ox so far, considering how many are drove together, makes but a small

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part of its prime cost, whereas in transporting of chickens from such distances, the expence of the journey would exceed many times, that of their first purchase, without including the hazard of their dying or losing their flesh, in so long a journey.

In the countries and provinces a great way from *Paris*, the price of a couple of chickens is very little more than that of a pound of butcher's meat, for when such a pound of meat is sold for seven farthings or two-pennies, a couple of chickens may be had for the same price: whereas in *Paris*, a couple of chickens will cost about as much as five pounds of meat; for when butchers meat is sold there for three pence half-penny or a groat a pound, a couple of chickens are sold for about twenty pence. If therefore chickens could be brought from as far off as oxen are driven, and that the bringing of them did not, in proportion, cost more money than the bringing of the cattle, a couple of chickens should not be worth more at *Paris* than about a groat, or five pence at the most, because of the greater duty upon chickens than upon butchers meat.

If there are certain places where it is of greater importance than in others, to employ stoves for the encreasing of the breed of chickens, there are also seasons when it will be more profitable to apply one's self to promote such an increase; and those seasons are at the times when birds of all sorts generally leave off setting. But this way there will be no season, in which one may not be able to promise one's self young chickens, young pullets, turkey-pouts, ducklings, and green geese: for one may hatch in stoves in every month of the year, eggs of all these several sorts of fowls. It is indeed true that hens lay but a very few eggs in

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the winter, yet one may hatch during all the month of *October*, the eggs that shall have been laid towards the end of *September*; and those eggs that shall have been kept in a cool or not too hot a place, will be very capable of being hatched, after they shall have been kept for six weeks or even two months. And the laying of hens and other domestic fowls will begin again before the end of *January*.

Nobody is ignorant how great a part of the sustenance of the people in the country, and even of those who live in great towns, consists of eggs in some way or other; and consequently the increase of the abundance of eggs is no less desirable, than that of chickens themselves: and how can such an abundance be any way so well brought about, as by encreasing the number of the hens? or what comes to the same thing, by the hatching a great number of chickens? It has been observed above, that this affair is carried in *Egypt* to such a height; as that they are there able to sell eggs at about two and twenty pence, or at most, half a crown a thousand.

The interruption which there is every year in the laying of eggs, is not only to be attributed to the cold, it is also the approach, the continuation, and the consequences of the moulting, that suspend the laying of the hens. Mr. *de Reaumur* proposes to make some trials, whether it might not be possible, to alter the time of the moulting of several of his hens; and the expedient which seems to offer itself for that purpose, is the hastening and bringing on sooner their moult, by the plucking away by little and little a considerable part of their feathers.

It is very important to be able to preserve eggs, whether for the procuring to one's self the use of them

them at the seasons when they are scarce, or to be able to carry them to sell, at distant markets.

Mr. *de Reaumur* taught us long since, that the way to preserve eggs is to varnish them, and thus they may be preserved for several months together, or even during the space of a whole year, as fresh as when they were but just laid. He now points out to us an expedient yet more simple, and at the same time equally efficacious: and that is only lightly to smear over their shells, with butter, with grease, or with oil. There is also another manner to have eggs, that may be kept a great while without spoiling, and which cannot but be looked upon as somewhat curious; this method consists in the procuring of barren eggs, or such as have no germs, that is, such as have never been impregnated by the male; for such eggs will not at all corrupt and grow rotten, even though they are set for a long while together under a hen, or kept as long in a stove.

Hens, which go about freely with the cocks, do sometimes nevertheless lay barren eggs. But one cannot be assured, that the eggs which they lay are barren, unless they have been kept apart from any cock for some space of time. And experience has shewed, that the treading of a cock will be sufficient to make all those eggs fruitful, which shall be laid afterwards for above a month together.

The advantages of the stoves, for the hatching and bringing up of chickens, which have hitherto been insisted upon, are those which are generally looked upon as the most real. Yet should we not look with indifference upon certain other advantages, that may also be expected from them. They may be of use to procure, to such as are studious of natural history and philosophy, the knowledge of several new facts, and the confirmation

mation and more perfect understanding of many others, which they may before have been made acquainted with.

There are no sorts of observations more proper to instruct us in the admirable ways by which nature brings about, the developement of the first germs of animals, by what means she brings on those germs to the state of visible embryos, and lastly those embryos to the size and strength of animals fit to be turned out into the world: no sorts of observations, I say, are more proper to instruct us in these things, than those which may be made upon what passes in the inside of the eggs of birds, from the beginning to the end of the time of their incubation.

The stoves will at least put us into the ability, of breaking at the same time a number of eggs, sufficient to shew us at one view, a complete series of all the degrees of their progress from the first to the last; and we shall thus be able at once to compare all those degrees with one another: whilst we may besides at the same time assure ourselves of the reality of their difference, by breaking together several of those, that shall have been placed at the same time in the stove, and that are consequently in the same degree of their progress from their first incubation. The comparisons that may be thus made will be far more exact, than what can be deduced from the drawings of any of those, who have taken the pains, and that with much less advantage, to represent to us the daily progress of the embryos in eggs, till they come to perfection.

Nothing can be more proper to furnish those who are so disposed with amusements truly philosophical, with amusements from which they may expect both curious and useful knowledge; than the observations that may be made upon the facts that

that will severally be presented by the different sorts of poultry in a yard well stocked with those creatures. Those which shall have been hatched in stoves, brought up without parents, and without any communication with others of their own kind, will particularly merit our attention. And it will most probably be found, that they will have the same tastes, the same inclinations, and the same industries, as those others that shall have been raised, in a manner more conformable to the ordinary course of nature. We shall from hence be able to conclude, that young birds have no need of instruction from their parents; as they will already have been sufficiently directed, by that GREAT MASTER, who has never failed to teach all his animated creatures, whatever it was necessary or proper for them to know. If, for example, it shall appear, that the chickens hatched and brought up in this new manner, will discover to us by their cry, that they are affrighted whenever they see in the air a bird of prey; we shall then certainly be well assured, that it is no other than the GREAT AUTHOR of nature, who has thus given them the knowledge of the enemies they have to apprehend. And if it shall appear, that the sparrows, the chaffinches, and the other small birds which shall have also been hatched in the stoves, and reared without any communication with others of their own kind, shall each of them, at the proper season, build their several nests, with the art and contrivance peculiar to their species: one must surely agree and be persuaded, that this art is as natural to them, as the circulation of the blood is, in their veins and arteries.

There is a singularity much admired in those little sparrows, commonly called *Amadevats*, which we receive from *Bengal*, which is, that after moult-

ing

ing they often become of a very different colour from that they were of before. But if one gives a particular attention to the cocks and hens, with which a good poultry yard is generally stocked, there will probably be found such among them also, as undergo the like changes. And Mr. *de Reaumur* has observed, upon this head, some facts at home, that would hardly have been expected.

Turkies, ducks, and geese, are among those fowls that are looked upon as part of the necessary stock of a back yard; these species of fowls, together with those of the different sorts of hens, are sufficient to give ample room for the observations and comparisons, that may be made concerning the different genii of the birds of several sorts, concerning the principal varieties of their forms, and upon their inclinations severally relative to those forms.

The alliances that might be made from year to year, between the hens and the cocks of different kinds, would render yet more interesting and more entertaining the phænomena they should present. It will be however necessary to take care, that all these several species, may not so far be confounded, as to be at the last entirely lost: and Mr. *de Reaumur* points out the expedients necessary to preserve those several species, and to prevent that inconvenience.

But these alliances between birds of different kinds, might perhaps give some light to a question, that still divides several of our best naturalists. Some will have the original germs to be naturally in the female, whilst others are of opinion, that they are only conveyed to her from the male in generation. Different kinds of mules, might possibly have afforded some insight into this very curious question, if sufficient attention had been hitherto given, to what they seem respectively to derive

rive from either parent. Mr. *de Reaumur* makes mention of two different species of cocks and hens, which differ from all the rest by very distinct characters: and he thinks that alliances between these species, and those of the more common sorts, might also be of use to furnish arguments, for judging to which of the two sexes the germs did originally belong.

It is very difficult to give any clear and distinct idea, by way of abstract, of a work that contains a very great number of very curious and very interesting particulars. Such is the work of which we have been endeavouring to give some sort of account: but by which we have rather proposed, to incite others to read the book itself carefully and throughout, than attempted to lay before them, by an enumeration of its contents, how many particulars in it, do well deserve their notice and attention.

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